

ANSWER KEY

..FIRST YEAR HIGHER SECONDARY EXAMINATION ...JUNE 2022

PART-III/III

SUBJECT:PHYSICS.....

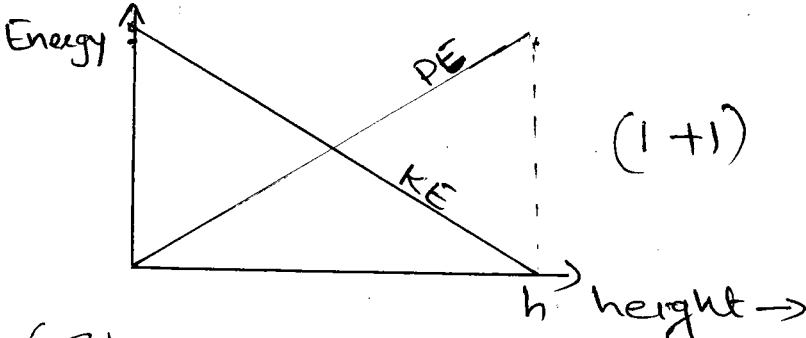
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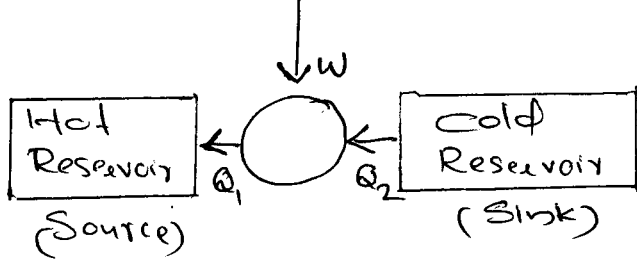
VERSION:

..... SCORES

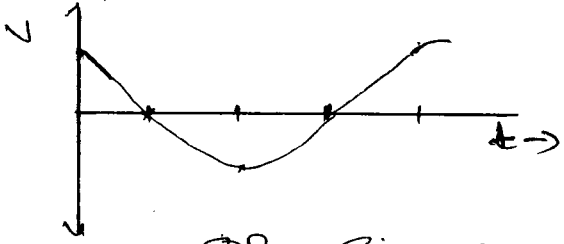
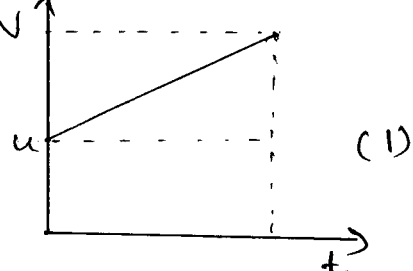
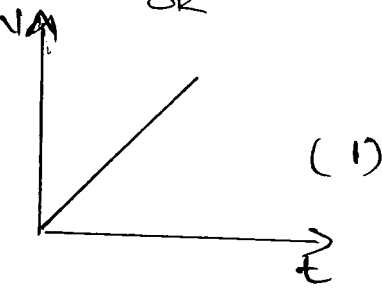
....2... HOURS

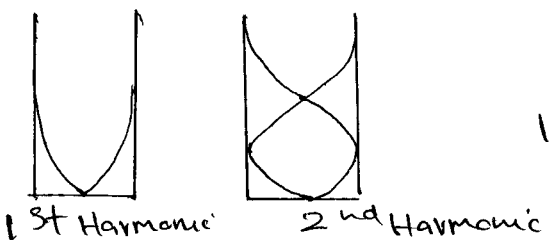
Qn. No	Sub Qns	Answer Key/Value Points	Score	Total Score
1.		Optics		1
2.		MT^{-2}		1
3.		$\theta = 90^\circ / \pi/2$		1
4.		2.3 km/s		1
5.		Decreases		1
6.		Light body		1
7.		Zero / minimum		1
8.		<p>upper half (1/2) lower half (1/2) Graph without values (1/2)</p> <p>Displacement = 6 - 6 = 0 / s = 0</p>	1	2

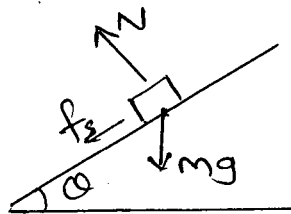
Qn. No	Sub Qns	Answer Key/Value Points	Score	Total Score
9.		At highest point. $V = u \cos \theta = 5 \cos 30 = 4.33 \text{ m/s}$ $= \frac{5\sqrt{3}}{2} \text{ m/s}$ or At highest point $V_y = 0 \quad (1/2)$ $V_x = u \cos \theta \quad (1/2)$ Acceleration $a = -g$ or $= -9.8 \text{ m/s}^2$ (Sign not necessary)	1 1	2
10.	(a)	Law of conservation of linear momentum or Third law of motion	$1/2$	2
	(b)	$V = \frac{-m_1 u_1}{M} = \frac{-15 \times 10^{-3} \times 100}{2} = -0.75 \text{ m/s}$ [Equation only 1 mark)	$1/2$	
11.		 (Shape only 1 mark)	2	2.
12.		A - Proportional limit B - Yield point / Elastic limit E - Fracture point / Break point OO - Permanent set / Residual strain	$1/2$ $1/2$ $1/2$ $1/2$	2

Qn. No	Sub Qns	Answer Key/Value Points	Score	Total Score
13.		 <p data-bbox="347 560 1181 739">Coefficient of performance $\beta = \frac{Q_2 / \frac{Q_2}{T_2}}{w / \frac{Q_1 - Q_2}{T_1 - T_2}}$</p>	<p data-bbox="1220 392 1284 459">$1\frac{1}{2}$</p> <p data-bbox="1220 616 1284 683">$\frac{1}{2}$</p>	2
14.		$I_1 \omega_1 = I_2 \omega_2$ $\frac{k_1}{k_2} = \sqrt{\frac{\omega_2}{\omega_1}}$	<p data-bbox="1220 817 1236 862">1</p> <p data-bbox="1220 929 1236 974">1</p>	2
15.		$\text{LHS} = [V] = LT^{-1}$ $\text{RHS} = \left[\sqrt{\frac{GM}{R}} \right] = LT^{-1}$ <p data-bbox="343 1220 1157 1456">LHS = RHS or Equations is correct or statement of principle of homogeneity (1 mark)</p>	<p data-bbox="1220 1041 1236 1086">1</p> <p data-bbox="1220 1131 1236 1176">1</p> <p data-bbox="1220 1265 1236 1310">1</p>	3
16.		<p data-bbox="335 1489 1173 1579">Derivatives of $a_c = \frac{v^2}{R} / \omega \omega / R \omega^2$</p> <p data-bbox="343 1590 774 1668">fig only 1 mark</p> <p data-bbox="343 1668 933 1736">final answer 1 mark.</p>	3	3
17.		<p data-bbox="327 1780 1189 1982">Proof of Total mechanical energy of a freely falling body = mgh with figure.</p> <p data-bbox="343 1982 774 2049">fig only 1 mark</p> <p data-bbox="327 2049 997 2105">Each part carries 1 mark</p>	3	3

Qn. No	Sub Qns	Answer Key/Value Points	Score	Total Score
18	(a)	Derivation of $g' = g(1 - \frac{d}{R})$ $g = \frac{GM}{R^2} / \frac{4}{3}\pi R \rho G$ 1 score $g' = g(1 - \frac{d}{R})$ 1 score.	2	3
	(b)	$w = 0$	1	
19.	(a)	Statement of Pascal's law	1	3
	(b)	$F_2 = \frac{F_1}{A_1} A_2 / \frac{F_1}{A_1} = \frac{F_2}{A_2}$ OR $P = F/A$ only ($\frac{1}{2}$ score)	2	
20.	(a)	Radiation	1	3
	(b)	change in temp $\frac{\quad}{\text{time}} = k \Delta T$ $\frac{8^\circ\text{C}}{2 \text{ min}} = k 70^\circ\text{C} - \textcircled{1} (\frac{1}{2})$ $\frac{2^\circ\text{C}}{t} = k 50^\circ\text{C} - \textcircled{2} (\frac{1}{2})$	1	
		$\textcircled{1}/\textcircled{2} \Rightarrow t = 0.7 \text{ min.} = \underline{\underline{42 \text{ sec}}}$	1	
21.		$P = \frac{1}{3} n m \bar{v}^2$ $PV = \frac{1}{3} n V m \bar{v}^2 \quad nV = N$ Derivation of $E_k = \frac{3}{2} RT$ (any correct method)	$\frac{1}{2}$ 2	3
		Average KE of a molecule $\bar{E} = \frac{3}{2} \frac{RT}{N}$ $= \frac{3}{2} k_B T$ OR Final Answer only 1 mark	$\frac{1}{2}$	

Qn. No	Sub Qns	Answer Key/Value Points	Score	Total Score
22.	(a) (b)	 <p>OR Sine curve</p> <p>$A = 20 \text{ cm}$ $k = \frac{F}{A} = \frac{50}{20 \times 10^{-2}} = 2.5 \times 10^2 \text{ N/m}$ $\frac{1}{2}$</p> <p>$\omega = \sqrt{\frac{k}{m}} = \sqrt{\frac{2.5 \times 10^2}{2}} = 11.2 \text{ rad/s}$ $\frac{1}{2}$</p> <p>$a = -\omega^2 x = -(11.2)^2 \times 10 \times 10^{-2} = 12.5 \text{ m/s}^2$ $\frac{1}{2}$</p> <p>$KE = \frac{1}{2} m \omega^2 (A^2 - x^2) = \frac{1}{2} \times 2 \times (11.2)^2 \times \left[\frac{400}{100} \right] \times 10^{-4}$</p> <p>$= 37.63 \times 10^{-4} \text{ J}$ $\frac{1}{2}$</p> <p>OR</p> <p>$k = \frac{F}{x} / \omega = \sqrt{\frac{k}{m}} / a = -\omega^2 x / KE = \frac{1}{2} m \omega^2 (A^2 - x^2)$</p> <p>(1 score)</p>	1	3
23.	(a) (b) (b)	 <p>$S = \text{Area under graph} = ut + \frac{1}{2} at^2$ (1)</p> <p>OR</p>  <p>$h = ut + \frac{1}{2} gt^2$ (1)</p> <p>$-25 = 20t + \frac{1}{2}(-10)t^2$</p> <p>OR $t = \underline{5 \text{ sec}}$ (1)</p> <p>Any correct method</p>	2 2	4

Qn. No	Sub Qns	Answer Key/Value Points	Score	Total Score
24.	(a) (b) (c)	Increases $m(g+a)$ or $\frac{m(g+a)}{g}$ App. wt = $30(10-5) = \underline{150\text{ N}}$ OR $\frac{30(10-5)}{10} = 15\text{ kg wt}$	1 1 2	4
25.	(a) (b)	Derivation of $\tau = \frac{dL}{dt}$ (Any method) $I_1\omega_1 = I_2\omega_2$ 1 score $V_2 = \frac{1}{8}V_1$ $R_2 = \frac{R_1}{2}$ $\therefore \frac{2}{5}mR_1^2 \frac{1}{T_1} = \frac{2}{5}mR_2^2 \frac{1}{T_2}$ $T_2 = \frac{24}{4} = 6\text{ hrs (1 score)}$	2 2	4
26.	(a) (b)	Viscous force, Gravitational force, upthrust (buoyant force) Derivation of $v_t = \frac{2}{9} \frac{r^2(\rho-\sigma)g}{\eta}$ or final eqn - 1 mark	1½ 2½	4
27.	(a) (b)	 1st Harmonic 2nd Harmonic $v_1 = \frac{v}{4L}$ (1) $v_2 = \frac{3v}{4L}$ (1) $v_1 : v_2 = 1 : 3$	1+1 2 2	4

Qn. No	Sub Qns	Answer Key/Value Points	Score	Total Score
28.	(a)		2	
	(b)	$N \cos \theta = mg + f_s \sin \theta \quad 1 \text{ mark}$ $N \sin \theta + f_s \cos \theta = \frac{mv^2}{r} \quad 1 \text{ mark}$ $v = \sqrt{\frac{rg(\tan \theta + \mu)}{1 - \mu \tan \theta}} \quad 1 \text{ mark}$	3	5
29.	(a)	$\frac{mv^2}{r} = \frac{GMm}{r^2} \quad 1 \text{ score}$ $v = \sqrt{\frac{GM}{r}} \quad 1 \text{ score.}$ <p>Period $T = 2\pi \sqrt{\frac{r^3}{GM}} \quad 1 \text{ score.}$</p>	3	5
	(b)	<p>One use of Geostationary satellite</p> <p>One use of Polar satellite</p>	1 1	
30.	(a)	<p>Statement / Equation 2 score.</p> <p>Derivatives 2 score</p>	4	5
	(b)	<p>Non viscous, incompressible stream.</p> <p>Line flow, steady flow (Any two)</p>	1	
31.	(a)	$PV = \text{a constant}$	1	
	(b)	$W = \int_{v_1}^{v_2} P dv \quad (1)$ $= \int_{v_1}^{v_2} \frac{RT}{v} dv \quad (1)$ $= RT \ln \frac{v_2}{v_1} \quad (1)$	3	

Qn. No	Sub Qns	Answer Key/Value Points	Score	Total Score
	(c)	$\eta = 1 - \frac{T_2}{T_1} \quad (1/2)$ $1 - \frac{293}{398} = 0.264 \quad (1/2)$ <p style="text-align: right;">26.4%</p>	1	5
32.	(a)	fig 1 score. $F = -mg \sin \theta \quad (1/2)$ $a = -\frac{g}{l} x \quad (1/2)$	2	5
	(b)	$T = 2\pi \sqrt{\frac{l}{g}}$	1	
	(c)	Pendulum whose time period $T = 2s$ length = 1m	1	

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